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WHAT AN AMBULANCE NURSE NEEDS TO KNOW; FROM EDUCATIONAL CONTENT TO CRITICAL INCIDENTS

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What an ambulance nurse needs to know; from educational content to critical incidents

THESIS FOR DOCTORAL DEGREE (Ph.D.)

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ABSTRACT

Ambulance personnel today are highly trained and perform specialized care. There are high expectations with respect to knowledge and competence of the Registered Nurses, RNs, in ambulance care, as they possess a medical responsibility for patient care in this setting. The overall aim of this thesis was to explore the training for RNs in ambulance care in Sweden and Europe, and to study the alignment between education and the need for training in clinical reality as reflected by critical incidents. The thesis builds on four studies;

Study I aimed to assess recommendations in Clinical Practice Guidelines, CPGs, for management of traumatic brain injury in the prehospital setting with respect to level of evidence. A systematic review was performed. Twelve CPGs were identified, including 21 prehospital recommendations for prehospital care. The number, as well as the content, of prehospital recommendations varied considerably and there was insufficient evidence for several topics relating to the care of patients with TBI, in a prehospital setting.

Study II aimed to describe the educational content concerning professional practice as presented in the curricula for the specialist nursing program in prehospital emergency care in Sweden. Eleven universities were included. In total, 49 curricula were analyzed with summative content analysis, resulting in three categories: medical-, nursing- and contextual knowledge. There was largest focus on medical knowledge and least focus on nursing, the registered nurses' main profession. **Study III**, a case study with the aim to identify core content in Swedish, Finnish and Belgian university curricula in education on advanced level for RNs in ambulance care, showed the same results with respect of distribution of core content. Study III also aimed to describe teachers' perception of the content that is required for the profession as a nurse in ambulance care. The teachers intended for the students' to acquire broad competence in clinical reasoning by implementing theory into practice, as well as developing the students' personal aptitude and instilling a scientific awareness.

Study IV aimed to explore critical incidents as perceived by ambulance nurses and to relate them to their perceived preparedness. Interviews with eleven ambulance nurses, using critical incident technique, showed that critical incidents were mainly related to experiential knowledge. The ambulance nurses emphasized decision-making in situations where both time and information were limited and that they were not able to prepare themselves mentally as the most common reasons why critical incidents occurred. Clinical rotations were considered to be the factor that was most important for managing the critical incidents that arose.

Conclusions and implications: CPGs for management of traumatic brain injury are incomplete and not always tailored for the prehospital setting. CPGs should be developed with high level of evidence to ensure that prehospital recommendations in guidelines are consistent, evidence-based, comprehensive, and thus promote better prehospital outcomes and avoid harm to patients. The course content in specialist training for RNs in ambulance care were similar for Sweden, Finland and Belgium with a focus on medical knowledge. The teachers in these countries aimed for the students' to acquire broad competence in clinical reasoning. The ambulance nurses from Stockholm perceived that the clinical rotations were considered to be the factor that was most important in avoiding and managing the critical incidents that arise. These results suggest that it is possible to create a common core curriculum for training for RNs to work in ambulance care. Moreover, a continuous development of the content of the training program based on the demands from the evolving health care sector is desirable.

LIST OF SCIENTIFIC PAPERS

- I. Hoogmartens, O., Heselmans, A., Van de Velde, S., Castrén, M., **Sjölin, H.**, Sabbe, M., Aertgeerts, B., Ramaekers, D. (2014) Evidence-based prehospital management of severe traumatic brain injury: A comparative analysis of current clinical practice guidelines. Prehospital Emergency Care. 18(2) 265-273 doi: 10.3109/10903127.2013.856506
- II. **Sjölin H.**, Lindström V., Hult H., Ringsted C., Kurland L. (2015) What an ambulance nurse needs to know: a content analysis of curricula in the specialist nursing programme in prehospital emergency care. Int. Emerg Nurs, 23(2015) 127-132 doi: 10.1016/j.ienj.2014.09.002.
- III. **Sjölin H.**, Lindström V., Hult H., Ringsted C., Kurland L. Common core content for education on advanced level for nurses in ambulance care; a case study on Sweden, Finland and Belgium.
Manuscript
- IV. **Sjölin H.**, Lindström V., Hult H., Ringsted C., Kurland L. Ambulance nurses' perception of critical incidents and their relationship to preparatory training.
Manuscript

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LIST OF ABBREVIATIONS

CIT	Critical Incident Technique
CPG	Clinical Practice Guideline
ECTS	European Credit Transfer System
ED	Emergency Department
EMS	Emergency Medical System
EMT	Emergency Medical Technician
ICU	Intensive Care Unit
RN	Registered Nurse
TBI	Traumatic Brain Injury

1 INTRODUCTION

The ambulance service has evolved from being a transport organization providing basic care to being a qualified health care resource (Lindström, Bohm & Kurland, 2015). Prehospital emergency care is defined as “immediate medical measures taken by health professionals outside the hospital” (SOSFS 2009-10). This means that the prehospital care refers to the patient’s entire path through the chain of prehospital care; from the first call to a medical dispatch center, via the ambulance care to the selected destination for continued care, e.g. the emergency department, ED. Ambulance care is “health care provided by health professionals within or adjacent to the ambulance” (SOSFS 2009-10).

The ambulance care setting is complex and unpredictable and the spectra of the patients’ problems and needs vary from non-medical to life-threatening conditions. Ambulance personnel have to be prepared for upcoming assignments, often based on limited information, and must be continuously ready for a change in the caring situation (Wireklint Sundström & Dahlberg, 2012). Decisions concerning care and treatment are made by registered nurses, RNs, independently, usually without support from a physician (Suserud, 2005; Lindström et al, 2015).

In this thesis, different aspects of competence and knowledge needed in the ambulance care setting are illuminated. The four component papers contain facts concerning the content in the specialist training for nurses in ambulance care in Sweden compared to similar training in Finland and Belgium, variability and level of evidence in clinical practice guidelines, CPGs, for traumatic brain injuries, TBI, and ambulance nurses’ perception of critical incidents and training for management of the types incidents described.

2 BACKGROUND

Today, ambulance personnel are well trained and provide specialized care, advanced medical assessments and treatment outside the hospital. The level of care also requires a high level of expertise among staff working in the ambulance service. This requires a broad range of competence and knowledge in various areas of emergency care (Dahlberg, Segersten, Nyström, Suserud & Fagerberg, 2003; Ahl & Nyström., 2012). More demanding qualifications, more training, and experience in emergency care have been shown to increase survival after severe conditions, such as out-of-hospital cardiac arrest (Fischer et al., 2010). Van Schuppen & Bierens (2011) explains that most of the diagnostic competencies can be provided by both ambulance nurses and physicians and that RNs can possess a wide range of skills. It is also shown that RNs with specialist qualifications increase the quality of assessments, for example when confronted with patients who have severe traumatic brain-injuries (Falk, Alm & Lindström, 2014).

However, there is no general agreement regarding the required level of competence needed to work in the ambulance care. Ambulances in Europe are usually staffed by one ambulance driver such as emergency medical technicians (EMT), with training in emergency care on a basic level, and one co-worker (Bos, Krol, Veenvliet & Plass, 2015). The co-worker is usually a paramedic. Paramedics are health care professionals with education on an advanced level and are represented in many countries. Paramedics are certified to perform advanced procedures, such as intubation, defibrillation and drug administration under standing orders from a physician (WHO, 2008). Physicians and RNs are also represented in several countries in an effort to enhance medical competence in common acute conditions (Langhelle et al., 2004; Lindström, Bohm & Kurland, 2015; Pozner, Zane, Nelson & Levine, 2004).

2.1 COMPETENCE, KNOWLEDGE AND EXPERIENTIAL LEARNING

Competence may be described as the ability to perform a task applying both knowledge and skills according to an appropriate, safety standard (Clements & Mackenzie, 2005, Socialstyrelsen, 2005). It is related to the common and sensible use of “communication, knowledge, technical skills, clinical reasoning, emotions, values, and reflection in daily practice for the benefit of the individual and community being served” (Epstein & Hundert, 2002). Competence also includes scientific knowledge and the development of moral attitudes and depends on responsiveness, critical curiosity, self-awareness, and presence (ibid.).

Professional knowledge includes knowledge relating to the professional practice, theoretical knowledge concerning technical, economic, organizational and social principles, and knowledge relating to an understanding of the context surrounding the work (Socialstyrelsen, 2005). Aristotle (384-322 B.C) described “the knowing”, the theoretical knowledge, as *episteme*, (i.e. “things that cannot behave other than it does”) - a condition that is resistant and therefore measurable and possible to have certain knowledge about (Burman, 2014). Epistemic knowledge is important, but should be enhanced with other forms of knowledge. The technical or practical knowledge, *techne*, is “know-how”, (i.e. knowledge to produce

something specific). The third form of knowledge is the practical wisdom reached through experience, *phronesis*, which relates to the use of theoretical knowledge in a practical situation; the abstract and concrete in united action (ibid.). For practicing nursing, both *techne* and *phronesis* are required (Benner, Tanner & Chesla, 2009). *Techne* by the procedural and scientific knowledge - producing outcomes - and *phronesis*, incorporated in practice, dependent on relations and human factors that guide what actions to take (ibid.).

Experiential learning is explained as the individual process of learning, based on the philosophical principle that understanding is a way of creating a version of the reality (i.e. constructivism) (Yardley, Teunissen & Dorman, 2012). Experiential learning is related to the context, in which it occurs and is acquired from situated, clinical practice. It reflects a holistic view (i.e. an understanding of how a practical situation is constituted). In the nursing profession, experiential learning is essential in the progress from being a novice to developing into an expert (Benner et al., 2009).

2.2 THE AMBULANCE SERVICE IN SWEDEN, FINLAND AND BELGIUM

This thesis studies the content of curricula for advanced education for RNs in ambulance care in Sweden, Finland and Belgium. The ambulance services in the three countries are organized in different ways;

Sweden has only a single level of ambulances. As of 2005, each ambulance in Sweden is required to have personnel holding license to administer medications (SOSFS, 2009.10). This regulation leads to ambulances being staffed by at least one RN, commonly with specialist training in prehospital emergency care (Lindström et al., 2015). The other member can be an EMT or RN without specialization. In a few counties, physicians are present in rapid response vehicles or in helicopters (ibid.).

Finland has two levels of ambulances: basic and advanced. At the basic level, the staff consists of a health care professional; such as an assistant nurse, a firefighter or an RN without specialist training (Finlex, 2011). In advanced level ambulances, at least one staff-member is an emergency care nurse (Ensihoitala) - an RN with specialist training in emergency care. The other member has training in basic life support. Physicians are present in rapid response units and helicopters (ibid.).

Belgium is in the process of change in the direction of a more uniform organization than its current prehospital care. The participating study site had a two-tiered system; basic and advanced level ambulances (personal communication, K. Bronselaer). On the basic level, ambulances are staffed by two EMTs. The advanced level unit, known as the “Paramedic Intervention Team”, is staffed by one RN with specialist training in emergency and intensive care, and one EMT with extended prehospital training. Physicians are present in rapid response units, together with an RN (ibid.).

2.3 REGISTERED NURSES AND SPECIALIST TRAINING IN AMBULANCE CARE

According to WHO (2009), the basic training for RNs in both Sweden, Finland and Belgium includes a minimum of three years of university studies in nursing at the bachelor level. These countries also offer an opportunity for one year of additional advanced level training in prehospital, emergency, and/or intensive care nursing (Dib, Naderi, Sheridan & Alagappan, 2011, The Swedish National Association of Ambulance Nurses and The Swedish Society of Nursing, 2012).

The post-graduated training for RNs in Sweden, the Program for Specialist Nursing in Prehospital Emergency Care, comprises 60 ECTS (European Credit Transfer System) and is regulated by the Swedish Higher Education Authority. Approximately twelve universities in Sweden offer the specialist training. The program provides a professional degree, with the restricted professional title of “ambulance nurse” and a one-year master’s degree in nursing sciences. In Belgium, the Advanced Bachelor’s Program in Intensive and Emergency Care, 60 ECTS (1 year) provides training that qualifies graduates for work in ambulance care services, the ED and ICU. In Finland, the emergency care degree program is integrated into a four-year program for registered nurses at a university of applied science. It comprises 240 ECTS (4 years), and provides a Bachelor’s degree as well as competence to work in ambulance care service, emergency department (ED), or intensive care units (ICU).

2.4 CRITICAL INCIDENTS IN THE AMBULANCE CARE SETTING

A critical incident is defined as a retrospectively told story, “generating an activity which through its retrospective perspective can be classified as critical only once it occurs” (Fridlund, 2012). Synonyms of “critical” can be crucial, considerable, important or obvious, and the incident described would express something that “stands out” (ibid.). Ambulance personnel are exposed to critical incidents relating to medical errors creating a risk for patients’ safety, as well as affecting the personnel emotionally (Hohenstein et al., 2014, Halpern et al., 2012). It has also been suggested that RNs in ambulance care worry about critical incidents in their daily work, such as specific emergency situations and situations related to the working environment, and that confidence in the other team member plays a crucial role in coping with these concerns (Svensson & Fridlund, 2008).

2.5 CLINICAL PRACTICE GUIDELINES

The use of evidence-based clinical practice guidelines, CPGs, is increasing in health care in order to improve the quality of care (Grimshaw et al 2004). In ambulance care in Sweden, for example, decisions concerning advanced procedures, such as intubation, defibrillation and drug administration are independently made by RNs under standing orders from a physician (Suserud, 2005; Lindström et al, 2015). CPGs are designed for healthcare providers to aid in making informed clinical decisions (Jun, Kovner & Stimpfel, 2016). The establishment of CPGs and standards for procedures can be viewed as an advantage in stressful environments such that which often prevails in an ambulance (Schneider et al. 2010).

The most preferable format for a CPG contains clear, current and updated recommendations for the workflow, in addition to simple descriptions of key recommendations (Lee et al, 2015;

Aboulsoud, Huckson, Wyer & Lang 2012). However, there are barriers to the practical adoption of CPGs. In one study, the content in CPGs was perceived by non-physicians as irrelevant to other professionals, user-unfriendly and unreliable (Lee et al. 2015). Moreover, there are also systemic and policy barriers, and problems with behavior and attitudes related to using CPGs (ibid.). Other researchers have also reported that compliance to guidelines is sometimes low and that there can be conflicts between existing practice and recommendations in the CPGs (Franschman et al 2009; Falk, Lindström, Bergvall & Castrén 2012; Lugtenberg, Burgers & Westert, 2009). This fact can be attributed to insufficient evidence and the lack of awareness of relevant evidence, and may cause confusion which can expose patients to suboptimal care (Figgis, Slevin & Cunningham, 2010; Oxman, Glasziou & Williams, 2008). In order to improve the use of CPGs and to ensure high quality care for all patients, nurses should actively participate in the development, implementation, and maintenance of CPGs (Jun et al, 2015).

3 STUDY RATIONALE

Ambulance personnel often encounter patients with acute, and sometimes severe, illnesses and injuries, while working in a demanding environment. CPGs with clear recommendations for care, transport and monitoring are an advantage and enhance the structure and management of care. It is necessary to have access to up-to-date findings when training ambulance personnel. There is a lack of CPGs specifically adapted to the ambulance care setting, related to common conditions. This thesis explores some of the issues concerning the level of evidence and variability of recommendations for CPGs for severe conditions, here exemplified by traumatic brain injury. In addition, the thesis explores how CPGs can be used in the education of RNs in ambulance care.

There are high expectations with respect to the competence of the RNs in ambulance care, as they are given medical responsibility for patient care in this setting. (Wihlborg, Edgren, Johansson & Sivberg, 2014; Ahl & Nyström, 2011). Policy documents for higher education in Sweden describe the overall intended learning outcomes, while each university chooses overall course content and designs learning activities. However, there is no guidance or description of the specific skills or requirements for each individual course. This leads to each university creating a course of study based on its own interpretation of the overall learning outcomes. Moreover, the relationship between the educational content and clinical need has not previously been evaluated. There is also no general international agreement regarding the required education and necessary competence for professional work in the emergency medical services. It is therefore of interest to explore the relevant training in these three countries that staff ambulances with RNs in order to identify the common core content.

The transition from being a student in the prehospital setting to joining the workforce is a time of anxiety and stress (Kennedy et al. 2015). Little is known about graduate ambulance nurses' preparation for unexpected and crucial events, which can be studied by investigating their perception of critical incidents. Hence, both tacit and formal knowledge, in addition to an awareness of which incidents may become critical, is required. To our knowledge, there are no prior studies describing ambulance nurses' perceptions of critical incidents or their perceptions of how their training prepared them for these situations.

4 AIMS OF THE THESIS

The overall aim of this thesis was to explore educations for Registered Nurses in ambulance care in Sweden and Europe, and to study the alignment between education and the need for training in clinical reality as reflected by critical incidents.

Specific aims were:

- | | |
|-----------|---|
| Study I | To assess the completeness and level of evidence behind prehospital recommendations in Clinical Practice Guidelines, CPGs, for the management of traumatic brain injury and to list key recommendations for prehospital emergency care for traumatic brain injury in order to create consistency between identified CPGs. |
| Study II | To describe the educational content concerning professional practice as presented in the curricula for the specialist nursing program in prehospital emergency care in Sweden. |
| Study III | To identify core content in Swedish, Finnish and Belgian university curricula in education on advanced level for RNs in ambulance care. The study also aimed to describe teachers' perception of the content that is required for the profession as a nurse in ambulance care. |
| Study IV | To explore critical incidents as perceived by ambulance nurses and to relate them to perceived preparedness. |

5 DESIGNS AND METHODS

In this thesis, a qualitative research design with different methods for data collection and analyses was chosen. An overview of the four studies is presented in Table 1.

Table 1: Overview of the included studies

Study	Design	Participants/Data	Setting	Data collection	Analysis
I	Descriptive Qualitative	12 Clinical Practice Guidelines (CPG), for traumatic brain injury (TBI) in adults. Additional publications containing identified recommendations for prehospital management of TBI in adults	Data bases for guidelines; g-i-n-.net, guideline.gov, clinicalguidelines.gov.au, Websites for CPG-development and specialty org. and medical care and treatment; Medline and EMBASE Google	CPGs containing recommendations for prehospital management of severe TBI in adults, were search for in databases and downloaded. Additional literature search for evidence of identified prehospital recommendations for TBI.	Screening for prehospital recommendations in identified CPGs. Grading of evidence according to grade level group (2000) and assess of variability and completeness of the prehospital recommendations in the CPGs and additional literature.
II	Descriptive Qualitative	46 Curricula from the specialist nursing program in prehospital emergency care in Sweden	11 specialist nursing program in prehospital emergency care in Sweden	Curricula were downloaded from the universities open websites	Qualitative summative content analysis according to Hsieh & Shannon (2005)
III	Case study, Descriptive Qualitative	28 Curricula from Advanced nursing education in prehospital and emergency care. 6 Teachers from specialist nursing program in prehospital and emergency care	One University in Sweden, Finland and Belgium performing advanced education for registered nurses in ambulance care	Curricula were downloaded from the universities open websites. Interviews with teachers	Qualitative directed content analysis of curricula and conventional content analysis of interviews according to Hsieh & Shannon (2005). Compiling of data in a Venn-diagram.
IV	Critical Incident technique (CIT), Descriptive Qualitative	11 Ambulance nurses from the ambulance service in Stockholm, Sweden	Ambulance service in Stockholm, Sweden	Interview study	Qualitative content analysis according to CIT and Flanagan (1958). Inductive analysis of described incidents, deductive analysis of described educational content.

Study I was a descriptive qualitative study, identifying prehospital recommendations for the management of traumatic brain injuries, TBI, in current clinical practical guidelines, CPGs. An evaluation of completeness and grading of level of evidence according to the GRADE level group (2000) were performed.

Study II was a descriptive qualitative study, using summative content analysis (Hsieh & Shannon, 2005) of content in course curricula in the specialist nursing program in prehospital emergency care in Sweden concerning professional practice, nursing and medical sciences.

Study III was a descriptive case study, inspired by Yin (2009), exploring core content in nursing programs at advanced level in prehospital and/or emergency care at one university each in Sweden (Case A), Finland (Case B) and Belgium (Case C). The content of curricula concerning professional practice was analyzed with directed content analysis (Hsieh & Shannon, 2005), using findings from Study II as a framework for the deductive analysis. A Venn diagram was used to show the common content. Data from interviews with teachers were analyzed with conventional content analysis in accordance with Hsieh & Shannon (2005).

Study IV was performed using the critical incident technique according to Flanagan (1954), a descriptive and qualitative design. Data were generated from interviews with ambulance nurses from Stockholm, Sweden, concerning perceived critical incidents in their professional work and their perception of how their education had prepared them for these situations.

5.1 PARTICIPANTS AND STUDY SETTINGS

5.1.1 Clinical practice guidelines and databases (Study I)

In Study I, the definition of a CPG according to the Institute of Medicine was used: “[CPGs are] statements that include recommendations intended to optimize patient care. They are informed by a systematic review of evidence and an assessment of the benefits and harms of alternative options” (Graham, 2011). To identify suitable CPGs, the Guidelines International Network (www.g-i-n.net), the National Guideline Clearinghouse (www.guideline.gov) and the Clinical Practice Guideline portal of Australia (clinicalguidelines.gov.au) were screened. Furthermore, an additional search using Google and of the so-called “gray literature”, i.e. websites from guideline development groups and specialist organizations, was performed. Literature in English, German and French, indexed in Medline and EMBASE, was searched.

5.1.2 Universities providing specialist nursing programs in prehospital and emergency care (Studies II and III).

The specialist nursing program in prehospital emergency care in Sweden is a one-year program, 60 ETCS, at one-year master’s level. At the time of Study II, twelve universities provided the education program. The inclusion criteria for participation were openly available course curricula at the university website.

Inclusion in Study III was based on three criteria: having ambulances staffed by RNs, providing specialist training for RNs in prehospital and/or emergency care, and having open

access to course curricula on the university's website. One university was selected from each country, based on convenience sampling: Sweden (Case A), Finland (Case B) and Belgium (Case C). The three included universities had extensive experience of performing the requested program and an admission of 25-50 students each year. In Finland, the specialist training at advanced level is integrated into a four-year program for registered nurses, performed by universities of applied sciences. It comprises 240 ETCS and provides a Bachelor's degree as well as competence and qualification to work in ambulance care, emergency departments (EDs) or intensive care units (ICUs). In Belgium, the program is an advanced bachelor's program in intensive and emergency care, 60 ETCS, providing competence and qualification to work in ambulance care, EDs and ICUs.

In Study III, two teachers from each participating university in Sweden, Finland and Belgium (n=6) were interviewed. Initial contact was established by e-mail, sent to the dean or an equivalent educational manager at the university, and forwarded to appropriate teachers for further contact, i.e. snowball sampling (Patton, 2002). All teachers had clinical experience from emergency medicine and pedagogical competence, working actively as course coordinators, teachers and/or lecturers in the specialist nursing program in question.

5.1.3 Ambulance nurses (Study IV)

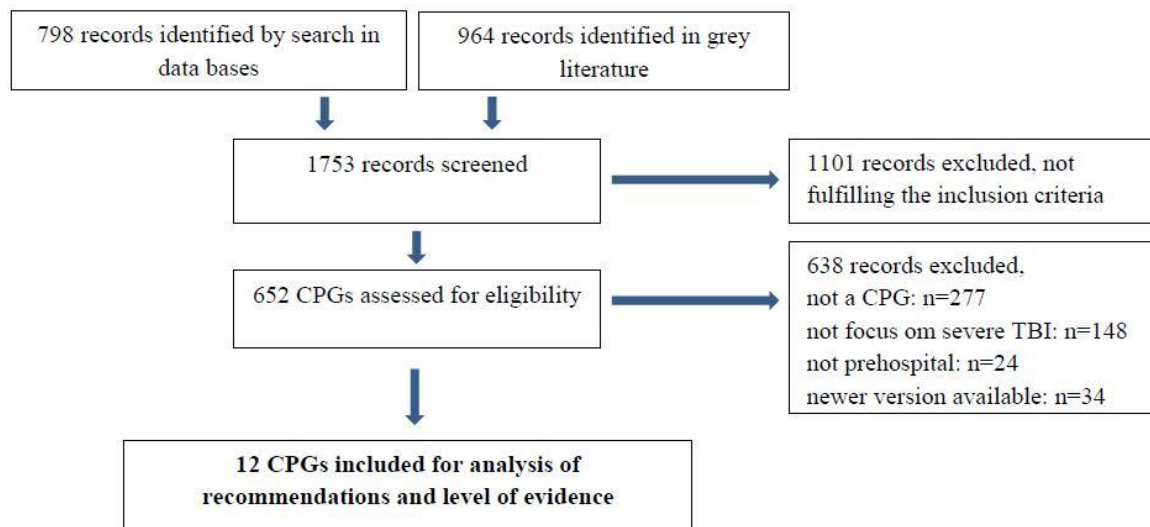
In study IV, data were generated from interviews with specialist trained ambulance nurses (n=11). The ambulance nurses were clinically active and selected from among employees of Stockholm County Council. The inclusion criteria for participation were ambulance nurses, having graduated from the specialist nursing program in prehospital emergency care in Sweden, working in ambulance care for at least one year equivalent to full time. Ambulance nurses who were on leave of absence and those with additional specialist nursing education were excluded. Contact with sixteen prospective interviewees was established by phone or e-mail. Five declined to participate and eleven semi-structured interviews were eventually performed.

5.2 DATA COLLECTION

5.2.1 CPGs concerning prehospital management of TBI (Study I)

Data in Study I were generated from GPCs, identified in web-based databases. The included CPGs were published between January 2000 and January 2013, and had a relevant list of references containing a clearly defined and specific recommendation for management of TBI. Guidelines focusing exclusively on non-traumatic injury, minor or moderate brain injuries and pediatric patients were excluded, as were publications concerning only CPGs on one specific treatment, such as surgical interventions. Of 652 guidelines that qualified for full-text assessment, twelve CPGs for the management of patients with severe traumatic brain injury fulfilled the inclusion criteria; see the flow chart for inclusion in Figure 1.

Figure 1. Flow of information through the different phases of the systematic search for CPGs in study I (Hoogmartens et al., 2014)



In order to assess the validity of the CPGs' evidence, a literature search was performed for the references supporting the clinical recommendation. Publications between January 2000 and February 2013 written in English, French and German, indexed in Medline databases, EMBASE, and the Cochrane Central Register for Controlled Trial were included.

5.2.2 Curricula (Studies II and III)

University programs are organized as courses and each course has its own course curriculum, including a description of the specific content. Curricula available on the university websites were downloaded. In both Studies II and III, descriptions of content concerning professional practice – nursing, medical sciences, skills and related theory concerning ambulance care – were identified and included for analysis. Course content concerning master's theses and theoretical knowledge in scientific theory and methods were excluded.

5.2.3 Interviews (Studies III and IV)

5.2.3.1 Teachers (Study III)

Four interviews with six teachers in prehospital and emergency care were conducted in order to explore their perception of what knowledge or skills they perceived as being most important to convey to students during the training, to be prepared for clinical work in ambulance care. The interviews also clarified the content and organization of the specialist nursing program in the country in question. In Sweden and Finland, two teachers from each university were interviewed simultaneously at the respective campus. In Belgium one teacher was interviewed and the second was interviewed by written correspondence, in accordance with the respondent's request. The interviews were semi-structured and the questions asked were open-ended. All interviewees were asked the same questions and similar follow-up questions, regardless of the interview technique. All verbal interviews were recorded and transcribed verbatim.

5.2.3.2 Ambulance nurses (Study IV)

Eleven ambulance nurses participated in the study, seven men and four women. The interviews were performed at a location agreed together with the interviewee, commonly at their workplace. Before the interview the respondents received information, both verbally and in writing, describing the aim of the study. They also received the first question so they could prepare for the interview. The interviews were narrative and performed using the critical incident technique (CIT) (Flanagan, 1954; Fridlund, 2012). They lasted for 25-60 minutes and were recorded and transcribed verbatim. The ambulance nurses were asked to enumerate and describe events concerning critical incidents, defined as “a crucial event, dilemma or situation which affected the ambulance nurse in a daily activity, in either a positive or a negative way”. Subsequent probe questions were asked about their perception of what made the incident critical. The interview also covered the ambulance nurses’ perception of preparedness by education for the described incident, in relation to presence and/or absence of training activities or content in their education.

5.3 DATA ANALYSIS

5.3.1 Qualitative synthesis and evidence grading (Study I)

The data analysis in Study I started by identifying the prehospital recommendations for management of severe TBI. A recommendation was defined as “any statement that promotes or advocates a particular course of action in clinical care” (Burgers, 2002). The twelve CPGs were screened for relevant recommendations for prehospital management of severe TBI, intended for professionals in the out-of-hospital setting. A total of 139 recommendations were identified, of which 50 were recommendations for prehospital care. After discussions in the study group, statements with similar content were merged after affinity; for example, recommendations regarding treatment with crystalloids, colloids, hydroxyethyl starch and mannitol were combined as recommendations for fluid management. To facilitate further analysis, the identified recommendations were consolidated into six “blocks”: initial diagnosis and physiological monitoring, initial treatment, emergency medical dispatch, transfer and logistics, and training and staff development. A search for the references in each CPG justifying the specific recommendations was made and an assessment of the completeness and level of evidence for each recommendation was conducted, using a graduation scheme according to the Grade Working Group (2000), see Table 2.

Table 2. Grading level of evidence in CPG for severe TBI (Hoogmartens et al., 2014)

Level	Description
High	Meta-analysis from multiple, relevant high quality RTCs with homogenous results or a systematic review with clearly positive or negative results
Moderate	Relevant, high quality RTCs *
Low	Controlled prospective studies
Very low	Retrospective studies or consensus-based methods

*RTC, randomized controlled trial

A second search of additional publications was made for each recommendation to assess the validity of evidence of the CPGs. Publications using systematic review and meta-analysis were firstly reported as source of evidence according to Table 2. Publications with unclear methodology were excluded. Finally, both similarities and differences were identified between the retrieved evidence from the literature search and the reported evidence in the evaluated CPGs.

5.3.2 Qualitative content analysis (Studies II, III and IV)

5.3.2.1 Three approaches of qualitative content analysis

Hsieh and Shannon (2005) describe three different approaches of qualitative content analysis: conventional, directed, and summative. In Study II, the summative approach was used and in study III, both directed and conventional approaches were used in various parts. In general, all three approaches are used to interpret meaning in textual data. The first part of the text analysis is common to the three approaches, i.e. a careful reading of the text, several times, to become familiar with it and to get an understanding of the text and its content. Differences are seen in the origination of the codes (for coding schemes, see Table 3) and how to ensure trustworthiness.

Table 3: Major coding differences among approaches of content analysis (CA), according to Hsieh & Shannon (2005)

Type of CA	Study started with	Timing of defining codes or keywords	Source of codes or keywords
Conventional CA	Interviews	Codes were defined during analysis	Derived from data
Directed CA	Research findings	Codes were defined before and during analysis	Derived from relevant research findings
Summative CA	Keywords	Keywords were identified during analysis	Derived from curricula

In Study II, the text for analysis was generated from curricula content from eleven specialist nursing programs in prehospital emergency care in Sweden. It was not narrated, but rather composed of sentences, or bulleted lists containing descriptive words. Keywords, describing the explicit content of the curricula, were identified and sorted by affinity, using the summative content analysis. The process generated subcategories and then overall categories appeared. When sorting the keywords an interpretation must be applied, partly by the significance of the word but also according to the distribution to a certain subcategory (Marshall & Rossman, 2011). Finally, the keywords were quantified in order to identify frequencies, distributions and patterns, but also to provide a contextual use for the keywords (Marshall & Rossman, 2011; Hsieh & Shannon, 2005).

The first analysis in Study III used textual data generated from content in curricula from education at advanced level for registered nurses (RNs) in ambulance care. In this study, each case – Sweden (Case A), Finland (Case B) and Belgium (Case C) – was analyzed separately

in order to synthesize the result and find common core content in the three specialist nursing programs. Using the results from Study II as a template, a directed content analysis was performed deductively, see Figure 2. Course content was extracted and transferred to a spreadsheet. The keywords were identified in the same way as in Study II and were placed under suitable subcategory. Keywords that could not be placed formed a new subcategory, called “17. Unplaced keywords”.

Figure 2, Frame of analysis in study III (Results from Sjölin et al., 2015).

Categories:	Medical knowledge	Nursing knowledge	Contextual knowledge
Subcategories:	1. Medical science 2. Clinical Judgment 3. Medical care and treatment 4. Medical Technology 5. Pharmacology 6. Hygiene	7. Nursing practice 8. Knowledge transfer 9. Ethical views 10. Patient relationship	11. Contextual skills 12. Employment impact 13. Policy documents 14. Management 15. Major accidents 16. Interprofession

To identify the distribution within the three cases, keywords in each case were compiled by category and counted. Keywords from one subcategory at a time were transferred into new individual spreadsheets. The keywords from the cases were placed beside each other to enable comparability. Finally, a summary of descriptions of similar content was formulated, dividing the data into three sets – one for each case. The content was put into a Venn diagram (Figure 3), showing the distribution of common content in all cases, the union of content in a combination of cases, and specific content individually.

The interviews in Study III aimed to describe the teachers’ perceptions of important knowledge or skills that students obtain during their education as well as about being prepared for clinical work in ambulance care. The interviews were recorded, transcribed and analyzed with a conventional content analysis, including perusal, reflecting and deriving codes during the time. The codes were sorted by relationship and how they linked together into meaningful clusters, formulating 15 subcategories, interpreted into four categories.

5.3.2.2 *Critical incident technique*

The psychologist John Flanagan established the critical incident technique (CIT) (Flanagan, 1954). There is no explicit method for analysis described in his original publication, but he expresses contextual knowledge and pre-understanding as an advantage when performing the analysis. In Study IV, the analysis was performed in two parts in accordance with Fridlund (2012). First, an inductive analysis of the description of critical incidents, as perceived by the ambulance nurses, was performed. Incidents were identified and extracted from the events narrated by the ambulance nurses after reading through the interviews several times. Content in the text, explaining what was critical in the event, dilemma or situation, was searched for, according to the aim of the study. The text sections became units of analysis, and were transferred into a spreadsheet. From the units of analysis, codes were derived and sorted by affinity, forming categories. The categories with commonality became main areas describing

causes related to why the incident occurred. Secondly, content concerning the ambulance nurses' perception of preparedness through education was analyzed. Text which answered how the content in the ambulance nurses' training related to the critical incidents became meaning units, coded in the same fashion as in the first part. The four main areas from the analysis of the incidents were used as a framework. The codes were sorted deductively into the appropriate main area to discern links between an incident and perceived related content in the training for ambulance nurses.

5.4 ETHICAL CONSIDERATIONS

Research has been performed partly on the basis of data consisting of documents – publications of clinical practice guidelines (Study I) and curricula from specialist nursing programs (Studies II and III) – in this thesis. This research does not deal with personal data, as covered by the Swedish Act on ethical review of research involving humans (SFS 2003:460). Data were also generated through interviews with teachers in specialist nursing programs (Study III) and ambulance nurses (Study IV), but no personal data were processed, and an ethical review was waived by the Ethical Board in Stockholm, Sweden (Diary number 2013/1164-31/5). The interviews performed in study III were approved by the management at the respective university in Sweden, Finland and Belgium.

The respondents were contacted by phone or e-mail and asked to participate in Studies III and IV. Before the interview they received written information about the aim of the study and the specific content of the questions. In accordance with the Declaration of Helsinki (World Medical Association, 2008), they were also told about who was responsible for personal data and who to contact concerning correcting any incorrect information, if necessary. Information concerning the possibility to withdraw from participation without further explanation at any time and confirming that this would not influence their work situation was also provided. A written informed consent was signed before the interviews were performed. The interview was recorded and transcribed verbatim. All names or any possibility to identify sensitive personal data were deleted before analysis and were not reported in the findings. All data were processed to prevent unauthorized access; the sound files were deleted and the transcribed interviews are to be stored securely for ten years.

6 FINDINGS

6.1 STUDY I

After screening the publications found in the literature search, twelve CPGs for the management of patients with severe traumatic brain injury fulfilled the inclusion criteria – see the description in Table 5.

Table 5. included clinical practice guidelines

CPG nr	Development group	Place published	Country/Area	Title	Year of publication
1	NICE	www.nice.org.uk/	United Kingdom	Head injury: triage, assessment, investigation and early management of head injury in infants, children and adults	2007
2	Lenartova et al.	Wiener Klinische Wochenschrift	Austria	Severe TBI in Austria	2007
3	Badjatia et al.	Prehospital Emergency Care	United States	Guidelines for Prehospital management of TBI, 2nd ed.	2007
4	Sacco et al.	Alaska Medical Journal	Alaska	Guidelines for the management of head injuries in remote and rural Alaska	2003
5	New Zealand Guidelines Group	goo.gl/mqf4P	New Zealand	TBI: diagnoses, acute management and Rehabilitation	2006
6	Rusticali et al.	Minerva Anesthesiology	Italy	Treatment of Minor and Severe TBI. National Reference Guidelines	2008
7	American Association of Neuroscience Nurses	goo.gl/QqIS9	United States	Nursing Management of Adults with Severe Traumatic Brain Injury	2008
8	Scottish Intercollegiate Guidelines Network	www.sign.ac.uk/	Scotland	Early Management of Patients with a head injury	2009
9	Dewall	Journal of EMS	United States	Evidence-based Guidelines for Adult Traumatic Brain Injury Care	2010
10	Shima et al	Asian Journal of NeuroSurgery	Japan	JSNT-Guidelines for the Management of Severe Head Injury	2010
11	New South Wales, Ministry of Health	www.health.nsw.gov.au	New South Wales	Initial Management of Closed Head Injury in Adults	2011
12	Hemphill et al	www.uptodate.com/	The Netherlands	Management of acute severe traumatic brain injury	2012

6.1.1.1 Recommendations for prehospital management of severe traumatic brain injury

A total of 139 recommendations were identified in the twelve CPGs. Fifty of the recommendations were statements for prehospital care. Statements with similar content were merged together and 21 key recommendations for prehospital management of severe TBI were identified – see Table 6. These CPGs were published between 2003 and 2012. Each CPG contained an average of ten recommendations (range 6-15), but none of them covered all 21 recommendations. Statements regarding prehospital transportation and management of advanced airway were most common in the CPGs.

Table 6. Overview of the 21 identified prehospital key recommendations in the twelve CPGs (Hoogmartens et al 2014).

1. Prehospital transport	8. Uncontrolled bleeding	15. Pulse oximetry
2. Advanced airway management	9. End-tidal CO2 monitoring	16. Communication
3. Glasgow coma scale	10. Training and staff development	17. Hyperventilation
4. Hypoxemia	11. Pupil reflex	18. Intracranial pressure lowering therapy
5. Blood pressure management	12. Use of steroids	19. Temperature management
6. Spinal immobilization	13. Blood glucose control	20. Neuromuscular blocking agents
7. Fluid management	14. Pain management	21. Anti-epileptic therapy

6.1.1.2 Completeness and level of evidence for the recommendations in the CPGs

Fifteen of the 21 recommendations were explicitly linked to evidence from prehospital trials. Three recommendations – blood sugar management, pain management, and communication – relied on evidence from in-hospital trials on trauma patients. The three recommendations concerning use of pulse oximetry, uncontrolled bleeding and training and staff development had no reference linked in the CPG manuscript. The evidence was mostly linked to trials with a moderate and high level of evidence for recommendations concerning initial treatment and physiological monitoring. In recommendations concerning initial diagnosis and prehospital transfer and logistics. The evidence was based on trials with low and very low levels of evidence.

6.1.1.3 Additional evidence of the recommendations

The publications found in the additional literature search (n=24) for evidence for the identified recommendations were not included as references in the CPGs. No differences were found between the evidence in the CPGs and the additional literature in recommendations for initial diagnoses or physiological monitoring (Lee et al., 2009; Silvestri et al., 2005; Timmons, 2011; Hoffman et al., 2012). There was an obvious consensus in the CPGs concerning recommendations for managing hypoxia and hypotension in the prevention of secondary brain injury. Results from recent trials, with a low level of evidence, showed that invasive airway techniques had no benefit in lowering serum carbon oxide (Hussman et al. 2011; Wang et al., 2013). Despite this, invasive techniques for airway management, combined with hyperventilation, were present in most CPGs and there were no recommendations for non-invasive techniques. Five CPGs had recommendations concerning fluid management. Three of them match the existing evidence with a high level of evidence describing treatment with normal saline as the drug of choice since no other fluids have been shown to be more beneficial (Chesnut et al., 1993, Bulger et al., 2010, Bulger, 2011; Perel & Roberts, 2012). In CPGs, initial treatments after TBI had a main focus on blood sugar control, how to prevent seizures and increased intracranial pressure. Five CPGs recommended tight regular monitoring of blood glucose levels according to the threat posed to patients when the blood sugar level varies. Recent randomized trials showed that invasive therapy with insulin should not be recommended in the prehospital setting, due to the increased risk of low blood sugar levels (Krinsley & Grover, 2007; Krinsley, 2008; Coester, Neumann & Smith, 2010; Bilotta et al., 2008). Finally, evidence (LOE moderate) showed benefits from more basic training for prehospital personnel, in contrast to five CPGs recommending more advanced training levels (Stiell et al., 2008; Jayaraman & Sethi, 2010; Ryyanen et al., 2010).

6.2 STUDY II

Eleven universities providing specialist nursing programs in prehospital emergency care were included in the study. In total, 49 curricula were analyzed, resulting in 16 subcategories and three main categories describing the content of curricula: medical knowledge, nursing knowledge and contextual knowledge.

Medical knowledge: The category contained the most keywords, n=298, describing the universities' perceptions of the knowledge needed in the ambulance care setting to perform a clinical judgement of a patient's condition and to give the right medical treatment when needed. It also involved how to act with a patient-safe approach. The subcategories were knowledge related to: medical science (n 113), mainly describing symptoms and pathophysiology in different injuries and conditions; clinical judgement (n 57); support systems for decision-making, assessment, physical examination and prioritization, medical practice and treatment (n 50); treatment strategies and guidelines, medical technology (n 33), pharmacology (n 29) and hygiene (n 16).

Nursing knowledge: This category contained 123 keywords focusing on nursing practice such as nursing interventions, physical and psychological care in various situations, including ethical perspectives in ambulance care. The subcategories were knowledge related to; nursing practice (n 44), knowledge transfer (n 29), ethical views (n 26) and patient relationship (n 24).

Contextual knowledge: The category contained 147 keywords of specific professional practice skills, reflecting the unique knowledge required in the ambulance care setting. The subcategories were related to contextual skills (n 34); specific techniques and subjects for performing advanced care in the ambulance care setting, employment impact (n 29); work environment-related situations, policy documents (n 27); laws, regulations and guidelines, major accidents (n 24); management (n 24); organization and leadership and interprofession (n 8); collaboration and team work from a prehospital perspective.

A specific analysis of the distribution of keywords from each university also was made, see Table 6. The numbers of keywords within each category were spread and there was a difference in how many words were used to describe the content for each course for the different universities; some of the universities were more detailed and used more words than others. One example is University Y which used 99 keywords in total, while university P used only 28 keywords. Despite this, the relative proportion of keywords between the categories was the same; i.e. the main focus, as reflected by the number of keywords, was on medical knowledge at all universities. There is a tendency towards profiling at some universities, such as university V, which seems to have more emphasis on medical knowledge, some nursing knowledge, and very little about contextual knowledge. On the other hand, university S has nearly equal distribution between medical knowledge and nursing knowledge.

Table 6. Distribution of keywords at each university (Sjölin et al., 2015)

University	Medical knowledge <i>n</i> (%)	Nursing knowledge <i>n</i> (%)	Contextual knowledge <i>n</i> (%)	Total <i>n</i>
O	28 (57)	9 (18)	12 (25)	49
P	14 (50)	5 (18)	9 (32)	28
Q	36 (54)	10 (15)	21 (31)	67
R	27 (71)	4 (11)	7 (18)	38
S	18 (42)	17 (39)	8 (19)	43
T	29 (41)	23 (33)	18 (26)	70
U	27 (52)	9 (17)	16 (31)	52
V	32 (75)	7 (16)	4 (9)	43
X	23 (50)	10 (22)	13 (28)	46
Y	46 (46)	25 (26)	28 (28)	99
Z	18 (56)	4 (13)	10 (31)	32
In total:	298 (52)	123 (22)	146 (26)	567

n = number of keywords.

% = percent of total *n* for the specific university.

6.3 STUDY III

In Study III, 28 curricula were included: four from Sweden (Case A), twelve from Finland (Case B) and twelve from Belgium (Case C). Altogether, the analysis generated 405 keywords describing the content; 59 percent were placed in the category “Medical knowledge”, 20 percent in “Nursing knowledge and 14 percent in “Contextual knowledge”. Keywords that could not be put in any of the preexisting subcategories made up seven percent. The distribution of keywords within the three cases was similar, see Table 7.

Table 7. Deductive distribution of keywords from curricula in specialist nursing program (Study III).

Category:	Medical knowledge <i>n</i> (%)	Nursing knowledge <i>n</i> (%)	Contextual knowledge <i>n</i> (%)	Unplaced keywords <i>n</i> (%)	Total <i>n</i>
Sweden, Case A	29 (57)	10 (20)	12 (24)	0 (0)	51
Finland, Case B	102 (57)	39 (22)	24 (13)	13 (7)	178
Belgium, Case C	107 (60)	33 (18)	21 (13)	15 (8)	176
Total <i>n</i> (%):	238 (59)	82 (20)	57 (14)	28 (7)	405

n=number of keywords

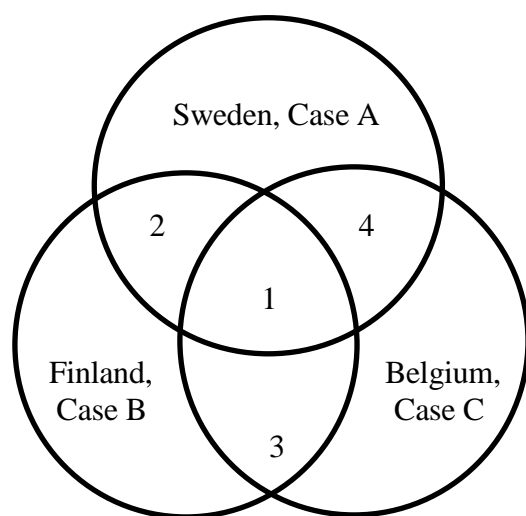
%=percent of total *n* for the specific case

In the Venn diagram, the keywords illustrate the common, shared and separate content in the cases. Content from all preexisting subcategories, except medical technology, major accidents, interprofession and policy documents, was represented in the overlap of all cases (A+B+C), see Figure 3.

Four main categories were revealed in the interviews. From the teachers’ perspective, the most important subjects were: clinical reasoning, application of knowledge, personal abilities and scientific awareness.

Figure 3. Venn diagram.

The content in curricula was divided into predetermined subcategories, see Figure 2. The diagram shows the common content in all three cases (Sweden, case A, Finland, case B and Belgium, case C), with curricula in section 1, the shared content in sections 2, 3 and 4, and the separate content in each case.



Sub.cat Section 1: Common content in Case A+B+C

1. Pharmacology in specific conditions
 2. Physiology
Pathophysiology in time critical conditions
Traumatology
 3. Care in emergency medicine
Treatment in specific emergency conditions
Trauma care and treatment
 4. Patient assessment
Continued monitoring and evaluation care
 7. Prehospital nursing
Nursing models and methods
Nursing in specific conditions
 8. Nursing approaches
Interaction with relatives
 9. Nursing documentation
 10. Ethical values in nursing
 11. Extrication and immobilization of trauma patient
Safe ambulance transport
 14. Leadership
 16. Prehospital safety
-

Sub.cat Section 2: Union of Case A+B

7. Nursing theories

Sub.cat Section 3: Union of Case B+C:

2. Pathology in children
3. Medical care and treatment of patients in ICU
11. Prehospital childbirth
12. Disaster medicine
13. Team work
15. Regulations and processes
17. Professional development
Public health

Sub.cat Section 4: Union of Case A+C:

6. Infection prevention and control
 11. Equipment in the ambulance
Radio communication
 16. Work environment
Crisis support
-

Sub.cat Separate content in Sweden, Case A

1. General pharmacology
9. Communication

Sub. Cat Separate content in Finland, Case B

3. Obstetric care
5. Safety in use of equipment
7. Rehabilitation methods
Obstetric nursing
14. Organization in emergency care
17. Prevention

Sub.cat Separate content in Belgium, Case C

1. Medication calculation
5. Specific equipment
17. Learning activities
Research

Interpretation: Concerning medical knowledge, both the content of curricula and the teachers' perceptions of what it was important to convey seemed to have the same intention; it is important to be able to perform relevant clinical reasoning and decision making with extensive medical knowledge. The main focus in curricula was on theoretical knowledge in medical care and treatment for time critical conditions in all ages. The teachers highlighted the challenge of learning to draw the right conclusions and understanding the consequences of treatment and in decision making. In the field of nursing knowledge, the curricula focused on prehospital nursing models and methods as well as on making nursing plans and documentation. The teachers did not discuss the subject explicitly, but ethical views in nursing were mentioned, discussing how to support the development of personal characteristics in the students and their approaches with patients and significant others. Table 7 illustrates that the Swedish curricula (Case A) differ from the other curricula in the distribution of keywords concerning contextual knowledge. In total, 14 percent of all keywords are placed in the category concerning contextual knowledge, but Case A had a higher proportion (24%) than Cases B and C, which had 13 percent each. The common content (subcategory 11, 14 and 16 – see Figure 2, the Venn diagram) contained contextual keywords including rescue techniques, e.g. extrication and immobilization of a trauma patient, safe ambulance transport and ergonomics. The interviews with the teachers underscored the application of theoretical knowledge in practice, e.g. the development and progression of skills, knowledge of contextual equipment, guidelines and specific care situations. The teachers, particular in Sweden (case A), were also of the opinion that having a scientific awareness – to teach according to the research process – was necessary in order for the student to be able to implement new research findings.

6.4 STUDY IV

The interviewed ambulance nurses were seven men and four women, on average 34.8 years old with 4.5 years of experience in the profession. Seven different universities in Sweden were represented as course providers for the interviewees in the specialist nursing program in prehospital and emergency care. The ambulance nurses described 47 events from their professional work, containing 175 critical incidents. The kind of events varied widely, from non-urgent everyday situations to events of an extreme and sometimes overwhelming character. The analysis of the interviews resulted in 15 categories, with four main areas emerging: critical incidents related to experiential knowledge from the ambulance care setting, preparedness for action, emotional reactions and ethical dilemmas. The analysis also showed how the content of their education, the specialist nursing program in prehospital emergency care, corresponds with the identified incidents, as perceived by the ambulance nurses.

Critical incidents related to experiential knowledge from the ambulance care setting includes seven categories related to knowledge and developed abilities, perceived as critical in the described events: the ambulance nurses' perception of decision-making, having an action plan, being adaptable, possessing practical skills, solving problems, dealing with equipment malfunctions and working in a team. The ambulance nurses believed that making decisions was challenging in several ways. Having a planned strategy or a predetermined action plan

was beneficial, but it was perceived as being necessary to be broad-minded, be adaptable and have alternative strategies in mind. Possessing practical skills, especially in difficulties of creating intravenous access, airway management and ventilation, recurred as critical in several of the events. Having to solve practical and logistical problems that arise and dealing with malfunctions in equipment and radio communication systems were cited as a reasons for not being able to perform necessary care. A lack of necessary competence in the working team was also considered to be a problem.

The ambulance nurses' perception of the specialist training varied, but an overall comment was the need for a broad knowledge basis and the fact that the education is too short. They perceived that the received theoretical knowledge was adequate for decision-making in relation to the described events, but some felt that there was a lack of psychiatry and theory concerning critically ill children. Skills training and simulation of time critical conditions were present, but some of the nurses called for more simulations; airway management in particular was highlighted. Clinical placement in the ambulance care setting was by far the most important part of the education, as perceived by most nurses.

Critical incidents related to preparedness for action includes three categories: ambulance nurses' perceptions of earlier experience of situations, not being able to think through the situation beforehand and working in an unpredictable environment. The importance of experience – either having or lacking experience of emergency medicine in general or in the context of ambulance care – was a commonly discussed topic. The constantly changing situation and not being able to prepare oneself were also mentioned as special challenges in the ambulance care setting. Common reasons were a lack of information and working in an unpredictable and unsafe environment. In particular, the need for – and lack of – assistance, both the need for additional medical support and the need for even more caregivers with “more hands”, was brought up.

The ambulance nurses considered having earlier experience as a RN in emergency care before starting the specialist nursing program to be an advantage, but they requested learning activities on how to deal with the unexpected and unpredictable environment which working in the ambulance care setting involves.

Critical incidents related to emotional reactions contained two categories: the ambulance nurses' perception of wanting to do more, and having emotional concerns. A willingness to do more in situations where it was not possible and dealing with their own feelings were brought up. Concerns about own emotional reactions, what could have happened and how to deal with very sick or injured children appeared repeatedly in the descriptions.

Only one respondent remembered discussions concerning how to be prepared for “the worst case scenario” during training, and two other ambulance nurses commented that they did not have any training at all in the subject but that it would have been relevant.

Critical incidents related to ethical dilemmas contained three categories of incidents: the ambulance nurses' perception of communication difficulties, dealing with ethical complexities and handling death. Difficulties in communication, often related to language barriers, occurred. Patients refusing care despite an obvious need dominated. Ethical conflicts when encountering children suffering harm were raised, and several of the ambulance nurses

had experience of such situations. Issues relating to dying, i.e. watching someone die and dealing with the relatives, were mentioned as being difficult.

In relation to the education, three ambulance nurses mentioned discussions during their training relating to ethical dilemmas when interrupting resuscitation and dealing with relatives after unexpected death, and also concerning children suffering harm. Three other ambulance nurses expressed a lack of such discussions concerning children as well as death/dying, severe injury and a knowledge of transcultural differences. There was also a request for simulations using video recording in training on how to approach and communicate with persons with mental illness.

7 DISCUSSION

7.1 DISCUSSION OF FINDINGS

The overall aim of the current thesis was to explore the training for Registered Nurses in ambulance care in Sweden and in other parts of Europe, and to study the alignment of educational programs and the need for training in clinical reality as reflected by critical incidents. The findings in Study II divided the content from university curricula from Swedish specialist nursing programs in prehospital emergency care into three main categories: medical knowledge, nursing knowledge, and contextual knowledge. All universities had their main focus on topics relating to medical science despite the fact that the RN's main professional field is nursing (ICN, 2010). The core content in university curricula from all of the three European countries in Study III (Sweden, Finland and Belgium) was similar to the findings in Study II, emphasizing the focus on medical knowledge and content relating to medical science, medical care and treatment and clinical judgment. The teachers interviewed in Study III agreed that clinical reasoning including being able to make assessments properly, and the ability to making the right decisions, as well as applying theory and practical knowledge, is essential. An expert panel dominated by clinically active ambulance nurses ranked medical knowledge as one of the competences required for proficiency in ambulance care (Wihlborg et al., 2014). Knowledge relating to medical sciences, together with nursing skills, brings a higher professional level to ambulance care, more motivation and greater competence in these areas (Melby & Ryan, 2005, Wireklint Sundström & Dahlberg, 2011, Holmberg & Fagerberg, 2010). The specialist nursing program in Sweden contained sufficient theory to make the necessary professional decisions in relation to critical incidents, as perceived by the ambulance nurses in Study IV.

Subjects relating to nursing knowledge represent approximately one-fifth of the keywords of the curricula in both Studies II and III. One explanation for this unexpectedly low proportion could be that the basic training program for RNs contains more knowledge in nursing, applicable in every nursing situation. An understanding of nursing may be assumed to have been acquired in this basic training, while the specialist training focuses on contextually relevant knowledge, in this case, as pertaining to ambulance care. A new nursing situation is needed in order to train the ability to discern important factors in caring situations (Benner, Sutphen, Leonard & Day, 2010), which suggests an increased need of teaching contextual nursing knowledge. In the ambulance care setting, unlike in-hospital situations, RNs are often expected to solve difficult caring situations with only one colleague, and they alone have the responsibility for implementation of nursing plans and medical treatments (Holmberg and Fagerberg, 2010; Suserud, 2005). The similar content of nursing knowledge in Study III from the three participating cases focused on nursing models, methods and approaches, as well as descriptions of prehospital nursing and interaction with relatives, which can all be seen as knowledge that enhances the RNs' skills that are necessary for caring relationships (Ahl & Nyström, 2012). Handling ethical dilemmas, mainly in situations concerning resuscitation and patients who did not want to go to hospital despite an obvious need for care, was identified as critical by the ambulance nurses in Study IV. They also asserted that the specialist program should include more knowledge and training related to psychiatric emergencies. These kind of difficult and demanding tasks are cited as an obvious part of

curricula that highlight emotional efforts (Williams 2012) and include practical and contextual ethical training situations (Rees, 2016).

Approximately one quarter of the content in the Swedish university curricula in Study II contained keywords describing contextual knowledge; the unique knowledge required to work in the ambulance care setting. Many of the critical incidents described in Study IV, were caused by environmental factors, practical logistics and the need for continuously solving complex medical, ethical and logistical problems. Interestingly, the content of contextual knowledges differed among the three universities curricula as presented in Study III; Finnish and Belgian university curricula contained relatively fewer prehospital subjects than did the Swedish curricula. The fact that Swedish programs have a higher proportion of content relating to prehospital subjects may be because the specialist nursing program for prehospital and emergency care in Sweden trains the RNs exclusively for working in the ambulance care setting, while Finnish and Belgian universities provide qualification for working both in ambulances and in the ED and ICU. The most important part of the specialist nursing program, as described by the ambulance nurses, was the clinical rotation. Learning is enhanced when the student interacts with the patient in a real life context (Axelsson, Jimenez & Bång, 2016). Developing a holistic view within the practical discipline of nursing, requires a person to undertake knowledge development over time by studying the underlying theory, and then practicing the intended discipline (Benner, 1984). This may be done in its clinical context, in the form of clinical rotations. This also facilitates the ability to perform qualified assessments and decision making in caring situations (*ibid.*). RNs in specialist education in prehospital care can be described as experienced nurses in a new context. rather than as students (Nilsson & Lindström, 2015). This is true in Sweden and Belgium, but not in Finland, where specialization is embedded in the educational programs.

One of the subcategories revealed in Study II contained keywords relating to policy documents; laws, regulations and clinical practice guidelines (CPGs). The ambulance nurses in Study IV felt that it was an advantage to have CPGs and predetermined action plans, especially when caring for patients with severe acute conditions. Some of the teachers in Study III were of the opinion that knowledge relating to current CPGs and the ability to provide care according to standing orders for treatment was central, and that implementing and linking to updated CPGs in professional training was recommended (Lee et al., 2015).

However, the findings in Study I show that the CPGs for management of adults with traumatic brain injury is incomplete and not always tailored for the prehospital field, and that most of the trials linked to the prehospital recommendations were performed in hospital settings. To some extent, the results could be transferred to the prehospital context, but some adjustment needs to be made in view of the special circumstances of the prehospital setting. The results in Study I concern management after TBI, but can also be viewed as an indication of how CPGs are viewed with regard to other severe conditions. Other studies have also reported that adherence to prehospital guidelines differs, but there is a lack of insight into the reason for this (Figgis et al., 2010, Ebben et al., 2013). Hence, despite the emphasis on using CPGs both in training and clinical practice, there is a shortage of evidence-based guidelines that specifically address the needs of prehospital care.

It is a challenge to educate and train ambulance nurses in relation to best practice for time-critical conditions when care-relevant evidence is lacking. Study I also showed that the level of evidence for the identified recommendations in the CPGs in many cases was based on non-randomized observational studies. Nevertheless, recommendations founded on hypothesis-generating observatory studies, alone, may threaten patient safety and generate inefficient, suboptimal care (Bahtsevani, Uden & Willman, 2004).

Universities are charged with providing knowledge and skills during a limited time, in this case, one year. The ambulance nurses in Study IV indicated that the one year of specialist training was too short, and that there was a need to evaluate the necessary knowledge in order to optimize the content so that it becomes more aligned with clinical needs. The essential training can be provided in the universities, but in order to obtain lifelong learning, all knowledge needs to be updated continuously. In Australia and New Zealand, paramedic students emphasized the importance of having a high level of expertise and knowledge, along with the need to update skills after graduation (Williams, Fielder, Strong, Acker & Thomson, 2014). Halldin & Danielsson (2007) also report that support from employers for continuing education is needed in order to maintain and update knowledge. This means that the training must continue. While the ambulance organization has a responsibility to create opportunities for this kind of continuing education, it is also a responsibility of the individual employees to upgrade their skills according to the latest evidence.

7.1 METHODOLOGICAL CONSIDERATIONS

The research approach in this thesis is explorative, and both qualitative and mixed method approaches are used. Qualitative data typically emanates from the context, based on fieldwork and relates to experience, perceptions, feelings and knowledge (Marshall & Rossman 2011; Patton 2002).

A systematic review of evidence-based CPGs was performed in Study I in order to identify and assess variability and completeness in recommendations for prehospital management after severe TBI. The inclusion of publications was limited to the languages familiar to the members of the research group. An extensive number of publications was found in the first literature search and to manage the analysis it had to be a temporary increase of members in the research group. These factors could create a risk of missing CPGs, and there was an awareness in the research group of that the strategy might not cover all existing CPGs. The researchers first independently extracted the identified recommendations for prehospital management of TBI, and then discussed them in the research group in order to minimize the risk of missing recommendations. The selected CPGs did not apply the same criteria when using references to support their recommendation, and they could miss references relevant to the identified statements for prehospital management after TBI. Despite these limitations, this is the first study, to our knowledge, that addresses recommendations for TBI in the prehospital setting.

In Study II, curricula from the Swedish specialist nursing program in prehospital and emergency care were analyzed. All participating programs comprised 60 ETCS and provided graduates with the same qualifications. However, the individual universities differed in their design of courses and curricula, as well as how the universities described the content of the

curricula. This fact could affect the part of the result describing differences in distribution of keywords between the universities. Summative content analysis according to Hsieh & Shannon (2005) was used, involving both manifest and latent components. The manifest analysis (i.e. counting specific words in a material) attempts to describe the sample and understand the contextual use of its content. It also reflects the complexity of the analysis, as well as generating meaning from the data (Sandelowski, 2001). The latent part refers to the process of sorting keywords by affinity and interpretation of underlying meaning. The keywords were placed in groups in which the content appeared to belong together. This process generally went smoothly, although some words were discussed exhaustively in the research group before they received final classification.

The aim of Study III was to identify common core content of education for RNs in ambulance care, in different countries. The three countries selected were staffing ambulances with RNs having advanced level post-graduate training. The design of the educational programs examined in Study III from Sweden, Finland and Belgium for this group differed, and the results may not be comparable in all ways. The Finnish advanced level education was integrated with the regular education for RNs, and the students were inexperienced in health care, and their education was designed accordingly. In Sweden and Belgium, the students are graduated RNs who have started their professional development as nurses, and the educational program reflects this. However, in Belgium, there is a greater focus on the in-hospital, rather than the prehospital, context, compared with Sweden. The Finnish educational program contained a number of curricula with content about all the subjects an RN needs, and specifically about emergency care on both the basic and advanced levels. This study identified and extracted advanced level curricula, but risked missing of some content of the basic courses.

There were only six teachers interviewed in Study III, a number that could be considered as being too low. However, the results of the interviews added deepened and supplemental information relating to the focus of the education and how curricular content is taught. These findings may not be transferable, but can be seen as an indication of important subjects in the education of RNs in ambulance care. One of the teachers interviewed in Study III wanted to answer the questions via e-mail. Kvale (2009) argues that interviews by email have their disadvantages. They are done through an asynchronous interaction, and it can be difficult to obtain detailed descriptions in contrast to the personal interview. In addition, the interviewer is not able to interpret body or spoken language. The same questions were used in both the oral and email interviews in order to achieve results that would be comparable to those obtained in oral interviews. In written correspondence, supplementary questions were answered by an ongoing e-mail conversation. In addition, the email interviews allow for a time for the interviewee to reflect on his or her response. The distribution of keywords reflects a relative proportion of keywords for each category. This may not, however, reflect the importance or the time allotted to this particular course, but rather, is a reflection of the distribution of keywords represented in the curricula.

Study IV was performed according to the critical incident technique (CIT), by Flanagan (1954) and the data was based on individual, semi-structured interviews. The ambulance nurses interviewed in study IV had comparable educational background, being RNs with training from the specialist nursing program in prehospital emergency care. However, they

had graduated from seven different universities, which can explain the differences in the way they viewed the training content. The ambulance nurses were purposefully selected among employees in urban areas in the Stockholm County Council area, but most of them worked in suburban areas with proximity to both urban and rural areas. This means that they had experience from working in different environments and under varying conditions.

The data collection from the interviews in Study IV was performed when some time had passed since the actual event perceived as a critical incident. Thus, there was an inherent risk that the interviewee has forgotten the exact details of the event, and the description can be affected (Flanagan 1954; Fridlund 2012; Pilhammar 2011). However, memories also can become clearer in the case of specific or extreme incidents (*ibid*). To achieve saturation of collected data, the researcher should “interview as many people needed to find out what you want to know” (Kvale, 2009). In CIT, it is not the number of interviews that is important, unlike other methods of collecting data. Flanagan (1954) considers that if the phenomenon is well defined, the number of incidents should be approximately 50-100 to provide sufficient yield in content and quality. In Study IV, eleven interviewees described 47 events containing 175 incidents, and this was considered to be sufficient.

During all the research processes in the current thesis, the findings have been verified with other experts in the same, or a related, field for the purpose of establishing credibility, (e.g., member-check and peer briefing), (Lincoln and Guba, 1985). Involving other researchers in the process and not performing the analysis alone, is another way to ensure trustworthiness. Therefore, the analyzing groups in this thesis consisted of people with broad experience and competence in higher education, coupled with clinical experience as ambulance nurses. The variety of different perspectives and experiences proved to be an advantage. Achieving credibility in the process of identifying keywords (Studies II and III) and interpreting underlying meaning in the material requires contextual knowledge and understanding on the part of the researchers, as well as the ability to disregard their own pre-conceived notions and contextual awareness. In Studies II, III and IV, the main author and one co-author have clinical experience of both ambulance care and a specialist nursing program in prehospital emergency care. This led to increased understanding of the data and the possibility of a deeper interpretation in the analysis. Flanagan (1954) argues that in a CIT-study it is necessary to have contextual knowledge when interpreting the data, but there can be a risk for preconceptions if the researcher cannot be objective (Fridlund, 2012), and recurring discussions and reflections took place in the research group. The events described in Study IV were experiences emanating from the daily work of ambulance nurses, which also increases trustworthiness (Sandelowski, 1993).

8 CONCLUSIONS

In Study I, twenty-one recommendations were considered as relevant to prehospital management of patients with severe TBI, based on the 12 guidelines identified. The number, as well as the content, of prehospital recommendations varied considerably and there was a clear evidentiary gap in several topics relating to the care of patients with TBI, in a prehospital setting. The use of these guidelines will not always facilitate decisions concerning the best or most appropriate practice for prehospital practitioners in caring for patients after TBI, which could affect the outcome for the patient.

The course content in the specialist nursing program for prehospital and emergency care in Sweden concerning professional practice in the ambulance care setting (Study II) had its primary focus on medical knowledge. Understanding what is being taught and how the course content is allocated, based on analysis of curricula, elucidates what the universities consider to be important in the future professional role of an ambulance nurse. The results of Study II clarify how the content in the education of ambulance nurses in Sweden looks today, and supports the contention that there may be reason to discuss the distribution of this content in the future.

Study III shows commonality with respect to core content in advanced education for RNs in ambulance care in three different countries. Here, too, the emphasis was on medical knowledge and with a focus on medical science, medical care and treatment, and clinical judgment. Content concerning contextual subjects differed among the three universities. The teachers from each country, however, intended for the students to acquire broad competence in clinical reasoning by applying theory to practice, as well as developing the students' personal aptitude and instilling a scientific awareness.

Regardless of type of event, acute or non-urgent, all situations in the ambulance care setting, can be perceived as a critical incident (Study IV). The critical incidents were mainly related to experiential knowledge in the ambulance care setting. The ambulance nurses emphasized decision-making in situations where both time and information were limited, and they were not being able to prepare themselves mentally as the most common reasons why critical incidents occurred. Clinical rotations were considered to be the factor that was most important in avoiding and managing the critical incidents that arise. However, but they wanted more skills training and simulation of complex nursing situations.

9 IMPLICATIONS

Study I shows that CPGs for management of adults with traumatic brain injury are incomplete and not always tailored for the prehospital setting. To improve guideline reliability, CPGs should be developed with specific clinical relevance and recommendations applicable to prehospital care, in this case. There is also a need for research with a high level of evidence to ensure that prehospital recommendations in guidelines are consistent, evidence-based, comprehensive, and thus promote better prehospital outcomes and avoid harm to patients.

The results in Studies II and III suggest that it is possible to create a common core curriculum for training RNs to work in ambulance care.

The ambulance nurses in Study IV indicated that there was a need to evaluate the essential knowledge base in the specialist training program in order to optimize the content so that it becomes more aligned with clinical needs. A continuous development of the content in the specialist training for nurses in ambulance care based on the demands from the evolving health care sector is desirable.

Knowledge often has a short shelf-life, and it is vital to keep abreast of developments in health care in order to ensure continuous professional development. Collaboration between universities, employers and employees in the ambulance service could facilitate continuous education.

10 FUTURE RESEARCH

The ambulance care setting is complex and unpredictable and the varieties of the patients' problems and needs differ from non-medical to life-threatening conditions. This thesis has clarified certain aspects concerning education and training to obtain knowledges and skills for the profession. In CPGs, statements concerning initial diagnosis and prehospital transfer had the greatest proportion of lower levels of evidence (low and very low). From a patient's perspective in a time-critical condition, these subjects should be in future research priorities and there is a need of research with a higher level of evidence.

The results in Studies II and III clarify how the content in the education for ambulance nurses in Sweden, Finland and Belgium looks today. However, there are reasons to discuss the allocation of the content in light of ongoing changes in society, health care and the clinical reality.

Curricula and course content concerning the master's thesis, as well as theoretical knowledge in scientific theory and method were excluded in Studies II and III. In light of the results of the interviews with teachers (Study III) showing that research awareness is viewed as important for the students in their development in the profession, the content should have been included. There are also indications that RNs with education on at least a Bachelors' level improve in-hospital survival when caring for an average of six patients, which mostly is the case in ambulance care (Aiken et al 2014) and these could lead to an interesting topic for further research.

There is no clear explanation or description of what competencies are relevant and knowledge needed in the ambulance care setting, and more research is required to answer the question of, and whether a national curriculum would be an advantage for our patients.

Further research is also needed to identify how staffing ambulances with RNs compares to using other professionals and how this may affect patient care and outcome.

The imbalance between categories in Study II could reflect a difference in competencies needed in the ambulance care setting. That said, however the relationship between curricula content, necessary competencies and patient outcome remains to be studied.

11 SAMMANFATTNING (SUMMARY IN SWEDISH)

Ambulanssjukvården har de senaste decennierna utvecklats från att vara en transportverksamhet till att också omfatta avancerad sjukvård. Ambulanspersonalen har idag ansvar för att relevant omvårdnad, medicinska åtgärder och behandlingar utförs. Detta sker oftast utan stöd från läkare, vilket innebär att det ställs stora krav på bred kunskap och kompetens hos personalen. Arbetet sker i skiftande miljöer, ofta under stress. För att underlätta i bedömning och beslut gällande omvårdnad, åtgärder och behandlingar är tillgång till kliniskt användbara, praktiska riktlinjer, baserade på vetenskap och beprövad erfarenhet, s.k. evidence-based clinical practice guidelines (CPGs), till fördel som stöd i det vardagliga arbetet. Idag saknas dock ofta aktuella CPGs med vetenskapligt prövade rekommendationer som är relevanta för vård av patienter i ambulans.

Inom ambulanssjukvården i Sverige, arbetar legitimerade sjuksköterskor med specialistutbildning på avancerad nivå. Specialistsjuksköterskeprogrammet inom ambulanssjukvård (60 högskolepoäng) leder till magisterexamen inom omvårdnad samt yrkestiteln ambulanssjuksköterska. De styrdokument som reglerar specialistsjuksköterskeutbildningarna beskriver endast i generella ord de lärandemål studenterna skall uppnå, och innehållet i utbildningen bestäms av den enskilda högskolan. Detta innebär att innehållet varierar mellan de olika lärosätena. Finland och Belgien har också valt att bemanna akutambulanser med legitimerade sjuksköterskor och för dessa sjuksköterskor finns motsvarande möjlighet som i Sverige att gå en specialistutbildning. I Belgien finns utbildningsprogrammet ”Advanced Bachelor’s Program in Intensive and Emergency Care” (60 högskolepoäng) som ger kvalifikationer att arbeta på akutmottagning, inom intensivvården samt i ambulans. I Finland är den avancerade utbildningen inom akutsjukvård integrerad i senare delen av grundutbildningen till legitimerad sjuksköterska. Utbildningen omfattar totalt fyra år (240 högskolepoäng) och ger kvalifikationer att arbeta på akutmottagning, inom intensivvården samt i ambulans. Inom Europa finns alltså ingen gemensam överenskommelse om vilken nivå av kompetens ambulanser bör vara bemannade med och det ser olika ut i olika länder. Detta gör det intressant att utforska innehållet i de olika utbildningsprogrammen för att förstå vad som är gemensamt men också vad som skiljer sig åt i de olika utbildningarnas innehåll.

Arbetet i ambulanssjukvården är mångfacetterat och oförutsägbart. Kritiska incidenter som kan påverka patientens säkerhet uppstår under arbetet, men de kan också påverka personalen emotionellt. En ”incident” kan beskrivas som ett dilemma, en episod, en händelse eller situation. Det finns studier som visar att ambulanssjuksköterskor oroar sig för att olika typer av kritiska incidenter ska uppstå. Det finns dock ingen beskrivning på vilka händelser som uppfattas som kritiska incidenter eller vilken handlingsberedskap som behövs vid dessa.

Avhandlingen bygger på fyra delarbeten vars syften belyser olika aspekter av kompetens och kunskap som behövs för att arbeta i ambulanssjukvården. Det övergripande syftet är att utforska utbildning för legitimerade sjuksköterskor i ambulanssjukvården i Sverige och Europa samt att studera följsamhet mellan utbildningens innehåll och relevans för kliniskt arbete, illustrerat genom kritiska incidenter.

I **Studie I** var syftet att bedöma innehåll och vetenskaplig bevisgrad (evidensnivå) i kliniskt användbara, praktiska riktlinjer, CPGs, gällande vård och omhändertagande utanför sjukhus, s.k. prehospital akutsjukvård, av traumatiskt uppkomna skallskador (traumatic brain injury, TBI) hos vuxna. Studien genomfördes genom en systematisk litteraturstudie och gradering av vetenskaplig bevisnivå (evidensnivå) av identifierade rekommendationer för prehospital vård. Ett flertal sökningar i olika databaser genomfördes för att finna relevanta och aktuella CPGs. Efter granskning identifierades 12 CPGs som innehöll 21 olika rekommendationer för prehospital vård och omhändertagande av TBI. I snitt innehöll de 12 CPGs tio prehospitala rekommendationer var. Ingen av de 12 CPGs innehöll samtliga 21 rekommendationerna. De vanligaste rekommendationerna gällde transportsätt och avancerad luftvägshantering. Den vetenskapliga evidensnivån var baserad på undersökningar med mycket varierande evidensnivå – från mycket låg till hög - och vissa av studierna var utförda på traumapatienter inne på sjukhus.

Studie II syftade till att beskriva innehållet i kursplaner gällande kliniskt arbete i ambulans i specialistsjuksköterskeprogrammet inom ambulanssjukvård i Sverige. Elva högskolor och universitet i Sverige ingick i studien. En summativ innehållsanalys enligt Hsieh & Shannon (2005) genomfördes av innehåll i 49 kursplaner. Resultatet visade att innehållet kunde delas in i tre kategorier; medicinska kunskaper, omvårdnadskunskaper och kontextuella kunskaper. Störst fokus låg på de medicinska kunskaperna och minst fokus var på omvårdnadskunskaperna, trots att omvårdnad är sjuksköterskans huvudsakliga profession.

Studie III var en fallstudie, case study, med syfte att identifiera gemensamt innehåll i kursplaner i utbildning på avancerad nivå för sjuksköterskor i ambulanssjukvård i Sverige, Finland och Belgien. Syftet var också att beskriva lärarnas uppfattning av vilket utbildningsinnehåll som ansågs relevant för kliniskt arbete som sjuksköterska i ambulanssjukvården. Tre universitet, ett från varje land, medverkade i studien och 28 kursplaner analyserades med riktad innehållsanalys enligt Hsieh & Shannon (2005). Subkategorierna från resultatet i Studie II användes som analysunderlag. Resultatet visade att innehållet hade samma fördelning och fokus i de tre länderna; övervägande fokus var på medicinska kunskaper. För att beskriva lärarnas uppfattning genomfördes intervjuer med sex lärare från de olika universiteten. Intervjuerna analyserades med konventionell innehållsanalys och visade fyra kategorier som illustrerar lärarnas uppfattning om vad de anser vara det viktigaste som utbildningen förmedlar till studenten; förmåga till kliniskt resonemang, att applicera teoretiska kunskaper i praktiken, att utveckla personliga förmågor och förhållningssätt samt vetenskaplig medvetenhet.

I **Studie IV** genomfördes individuella intervjuer med elva ambulanssjuksköterskor i Stockholm. Syftet var att utforska vilka kritiska incidenter som ambulanssjuksköterskor upplever i sin yrkesutövning samt deras uppfattning om handlingsberedskap för dessa. Intervjuer och analys genomfördes i enlighet med Flanagan's critical incident technique, en intervjuteknik där deltagaren uppmanades att räkna upp händelser som uppfattades vara avgörande, innehålla något utöver det vardagliga och som på något sätt påverkat arbetssituationen, positivt eller negativt. Ambulanssjuksköterskorna beskrev 47 händelser som innehöll 175 identifierade kritiska incidenter. Typer av händelser varierade, allt från icke-akuta vardagssituationer till extrema, ibland övermäktiga, situationer. Analysen visade att de kritiska händelserna var relaterade till fyra huvudområden; erfarenhetsbaserad kunskap,

handlingsberedskap, känslomässiga reaktioner och etiska dilemman. Under intervjuerna fick ambulanssjuksköterskorna också beskriva hur de uppfattade sin handlingsberedskap för de händelser de beskrivit med utgångspunkt i sin specialistsjuksköterskeutbildning.

Ambulanssjuksköterskorna uppgav att de upplevde att utbildningen de genomgått innehöll adekvata teoretiska kunskaper för att fatta nödvändiga beslut och att den verksamhetsförlagda utbildningen var den viktigaste delen av utbildningen för att få förståelse för kontexten. De efterfrågade utbildningsmoment i hur man hanterar oväntade och oförutsägbara situationer, färdighetsträning och simulering gällande svårt sjuka och skadade barn och luftvägshantering. Mer kunskaper i psykiatri och träning av bemötande av patienter och närstående var också önskvärt.

Sammanfattningsvis kan arbete som sjuksköterska inom ambulanssjukvården beskrivas som komplext och oförutsägbart. Ambulanssjuksköterskorna från Studie IV såg det som en fördel att använda CPGs som stöd för att hantera de vårdssituationer som uppkommer, men resultatet i Studie I visar att det idag är det stora variationen i både innehåll och evidensnivå i aktuella riktlinjer gällande traumatiska skallskador. Dessa var heller inte alltid utformade för arbete utanför sjukhus, vilket skulle kunna påverka den prehospitalt utförda vården och därmed patientens framtida status. Innehållet i specialistsjuksköterskeprogrammen i Sverige, Finland och Belgien hade störst tonvikt på medicinska kunskaper, vilket också uppfattades som relevant av de intervjuade ambulanssjuksköterskorna för att fatta nödvändiga beslut vid kritiska incidenter. Lärarna från de tre Europeiska lärosätena hade som intention att stödja studenterna i att utveckla förmåga till kliniskt resonemang, utveckla personliga förmågor och attityder samt en vetenskaplig medvetenhet. De framhöll även vikten av att omsätta teori i praktik, vilket bekräftades av ambulanssjuksköterskornas uppfattning om att den verksamhetsförlagda utbildningen, praktiken inom ambulanssjukvården, var den viktigaste delen av sin utbildning för att hantera.

För att uppnå bättre klinisk relevans och därmed förbättra för patienterna, bör CPGs i framtiden utgå från prehospitalt utförda studier med högre evidensnivå samt formuleras utifrån de speciella förutsättningar som råder i den prehospitala vården. Det finns också möjligheter att skapa övergripande, gemensamma utbildningsplaner med riktat innehåll för arbete som sjuksköterska inom ambulanssjukvården. Innehåll i utbildningarna bör anpassas och utvecklas i takt med den ständigt utveckling som pågår inom hälso- och sjukvården. Kunskap kan betraktas som ”färskvare” och det finns ett ständigt behov av uppdatering och fortbildning efter utbildning där både universitet och arbetsgivare, men också den enskilda sjuksköterskan, har ett gemensamt ansvar för fortsatt kunskapsutveckling.

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